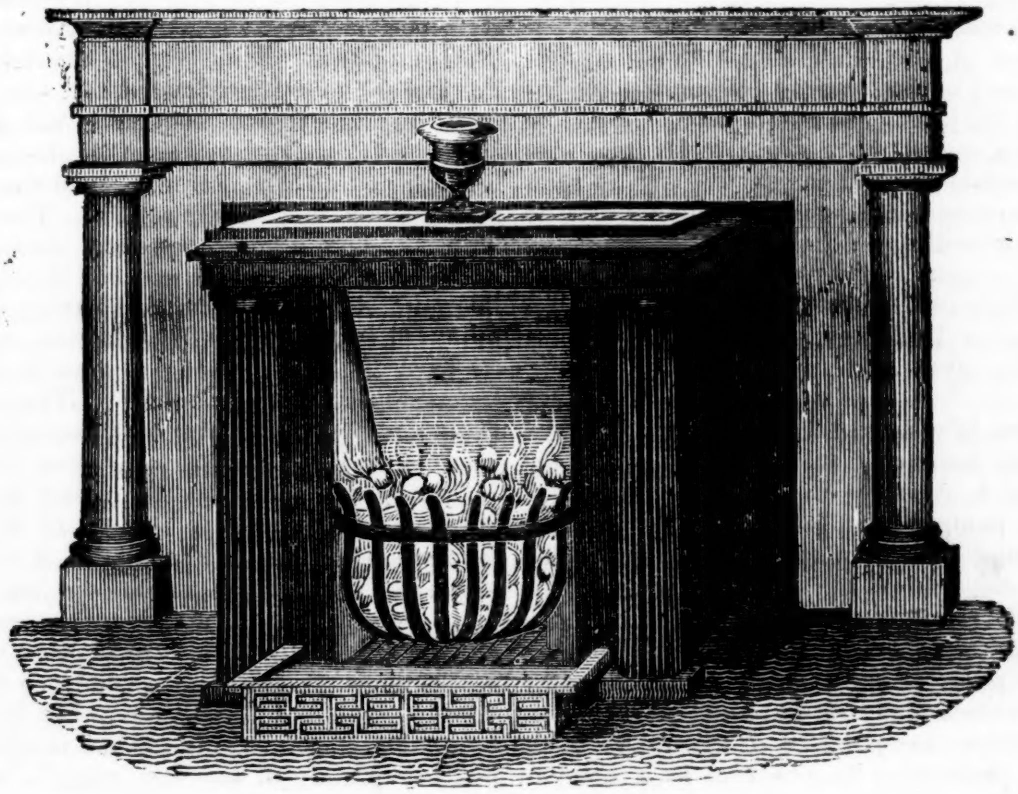
MECHANICS' MAGAZINE,

AND

REGISTER OF INVENTIONS AND IMPROVEMENTS.

VOLUME IV.] FOR THE WEEK ENDING SEPTEMBER 27, 1834. [NUMBER 3.

THE DORIC FIRE-PLACE.



The Doric Fire-Place for burning Anthracite or Bituminous Coal.

We have seen a contrivance for burning anthracite, and indeed any other kind of coal, that should combine the advantages both of an open grate and of a close stove, without subjecting the room to the inconveniences of either. The enormous loss of heat at which coal is burnt in the common open grate has been heartsickening to those of us who have to *pay* for our coal, and to *earn* the money that we pay; for in a common open grate, where a column of air is constantly poured out of the room, up chimney, with nothing to re-place it but fresh cold air pressing through every crack, by door or window, at least three quarters of the heat that is generated by the combustion of the coal is lost to the room; and then, if, in order to avoid this sacrifice of cash and comfort, we have recourse to a close stove, our room may, indeed, be heated, but it is very inadequately ventilated; and while the air is heated, it is also vitiated by the iron plates of the stove, (often raised to a red heat,) over which it passes.

In the Doric Fire-place, the evils, both of the open grate and of the close stove, are avoided, and the chief advantages of both are secured.

We say nothing of the form or style of this article, for in regard to that every one must be allowed to decide according to his own taste. We may however remark, that it has our vote, for it presents a classic front; and if the ladies will look at it with a touching remembrance of all the "toil and trouble" that the brightening up of their brasses now gives them, we are sure we shall have their votes also in favor of the simplicity of the Doric Fire-place.

The following is a statement of its utility:

It secures the safe and *entire* combustion of the coal;

It *saves the heat* produced by that combustion, and converts it to use by diffusing it equally and pleasantly through the room;

It secures the room from *the evil of a smoking chimney*, without recourse to the bad alternative of an open door or window;

It combines, and in itself unites, all the principal advantages of *both the usual modes of communicating heat by radiation*, as in common fire-places, and by *transmission*, as in close stoves—securing the benefits of both without the evils of either. It *warms* while it *ventilates* the room. It is so far *portable* that it can be set into a common fire-place, and again removed from it without injury to the jambs, so that it may be used by a tenant without becoming a fixture. Its construction or arrangement of parts is such that the iron plates are indestructible by the heat, and will therefore *last indefinitely*.

Any person desirous of seeing the Doric Fire-Place can be gratified by calling at No. 1, Chester Buildings, corner of Broadway and Dey street.

Mr. Arnold's Second Report of the Book and Tract Society of the First Congregational Church, New-York.

The pamphlet before us is the second semi-annual record of the proceedings of the public minister of this society. Our author is employed by the society to visit the distressed in any part of the city, and to dispense relief in such instances as he may deem suitable, as well as to administer suitable advice, temporal and spiritual. It is really distressing to observe, in a country abounding with every blessing and luxury that could be wished for, that such scenes of misery and woe should be found as he portrays in the following extracts from his report:

"Would you have a more distinct view of this squalid misery? Go to that cellar up yonder narrow and filthy alley, and look around you. You arrive at the threshold. The room is dark and damp, and noxious vapors and a most offensive odor issue from the opened portal. You involuntarily shrink back with disgust, but, nerving yourself up with firmer resolution, you enter, and what a scene presents itself! A table with three legs leans against the dingy wall, upon which are a few pieces of unwashed and half broken china, surrounded by the fragments of the last miserable meal. A few broken chairs are standing about the room. A bottle and a cup are upon the mantle-piece. A bed of straw, covered with rags, a receptacle for filth and vermin, lies upon a crazy bedstead, or perhaps upon the floor, while the corners and recesses of the room contain the accumulated sweepings of weeks, perhaps of months. Other furniture, if other were ever possessed, has long since gone to the pawnbrokers to furnish the means of debauchery or subsistence; and this remains only because it is absolutely valueless. But this is not all: would to God it were. Upon that bed lies a sick infant. Its head is enlarged and deformed; its eyes are dull; its countenance devoid of expression, save that of misery; its frame is emaciated; it is but half clad, and its disease is the consequence of filth, and exposure, and want of nourishment. Several of its brothers and sisters are already in the churchyard, whither it will probably soon follow, relieved from its present sufferings, and all who know it, even the inhuman mother herself, will rejoice. The other children, with neither hats nor shoes, with unwashed faces, and uncombed heads, are roaming about the streets, or loitering around the markets, or upon the wharves, seeking by importunity, or fraud, wherewith to satisfy the cravings of appetite. The mother stands and gazes at you with astonishment, seeming to wonder what can have brought you to her loathsome dwelling, and hesitates whether to welcome you or not, as hope or fear preponderates in her mind. A word of kindness, however, to which she has been long unused, hastens her decision, and wiping her chair with a tattered apron, she offers you a seat. Her appearance is too revolting for minute description, but her discolored eye, and deeply gashed temple, tell but too plainly of the last night's revelry and succeeding affray. The husband and father is at the ale-house.

"Such are the inmates of this wretched habitation. Such is a description, with some slight variation in the details, of many a miserable and neglected family in this happy land. For them there is no season of prosperity and plenty. Their state is one of continued famine. To them no friend of publicans and sinners proclaims 'glad tidings.' They are outcasts from society; almost abandoned to ruin and desolation, and even excluded from common sympathy. And yet these are human beings—our brethren—the creatures of that God 'who has made of one blood all nations of men, to dwell on all the face of the earth.'"

On the Arrangement of Cylindric Steam Boilers.

To the Editor of the Mechanics' Magazine:

Sir,—It is well known that a cylindric steam boiler, thirty inches in diameter, made

of wrought iron plates one fourth of an inch thick, will sustain a pressure of more than one hundred pounds to the square inch. Of course, a cylinder of the same material, three inches in diameter, will sustain an equal pressure, although the iron of which it is made be but one fortieth of an inch thick; the thickness and strength of the iron being in the same proportion to the diameter as those of the thirty inch cylinder. A thirty inch boiler, eighteen feet long, and presenting one third part of its surface to the action of the fire, will produce about six horse power of steam: from which it may be inferred, that thirty-six cylinders, each being thirty inches long and three inches in diameter, and presenting two thirds of their surface to the action of fire, will also give a six horse power of steam; yet the weight of the thirty-six cylinders may be less than one sixtieth part of that of one large cylinder of the dimensions above specified. Several inventors have endeavored to avail themselves of this principle, but I know of no instance in which they have fairly succeeded in evading the difficulties attending the construction of a boiler consisting of many cylinders or pipes. In one instance, the pipes were so small that they soon became smoked; in another, they were arranged horizontally, consequently the steam could not readily escape; and in both, the pipes have been connected with cross-pipes by brazing, which rendered it difficult to keep them clean from the sediment which always accumulates in boilers; or to remove one without disturbing the arrangement of the rest. With this view of the subject, I have lately constructed a boiler on this principle, which appears likely to be useful for locomotives at least. It produces rather more than one horse power of steam, will sustain a pressure of three hundred pounds to an inch, weighs less than eighty pounds, and cost, (made of copper,) less than sixty dollars; yet so constructed, that the steam rises freely, and that either of the cylinders may be removed occasionally and replaced again in five minutes. The following is the specification of a boiler of the same construction, but of larger dimensions, and calculated for three horse power.

Twenty-four cylinders, made of sheet iron or copper, each being thirteen inches in length, and two and a half inches in diameter, are arranged vertically in two rows, parallel to each other, the cylinders in each row being half an inch apart, and the space between the two rows being eight inches. Each cylinder has a cast metal head at each end, secured by revits, or by brazing; and from the centre of which projects a tube an inch and a half long and one inch in diameter; each tube having ears projecting half an inch from two opposite sides, by which the tubes are secured by screws to the sides of four pipes, which are placed horizontally, parallel to each other, one at the top and another at the bottom of each row of cylinders. These tubes may otherwise be secured to the pipes, by having an iron strap bent over each tube, and a screw passing through each end of each strap into the side of the pipe. One side of each tube is nicely fitted to the side of the pipe to which it is attached; and the pipe and tube having each a corresponding orifice at the point of contact, an internal communication is effected between each cylinder and each pipe connected with each row. These parallel pipes, which are about one inch and a half in diameter, are also connected by cross-pipes at each end. The cross-pipes are cast with a cube at each end, or at the point of connection with the side-pipes; and instead of being open at the ends, have an opening on the side of each cube of a size to admit the end of the side-pipe; and a small iron rod, passing through the length of the side-pipe, and through the cube at each end, has a square head at one end, and a screw and nut at the other, by which the opposite cubes are drawn up to the ends of the pipe. Note—The length and size of the cylinders, the number of cylinders in a row, or the number of rows, may be varied as occasion may require.

The lower part of the cylinders are inclosed in a sheet iron furnace or stove, the height of which is equal to two thirds of that of the cylinders. The top of the stove being fitted to the several rows of cylinders, and the cylinders being filled two thirds full of water, the fire within the stove cannot approach them above the surface of the water. Between the two rows (or each two rows) of cylinders, at the bottom, is a grate, which rests on the bottom pipes; and at the top of the stove a horizontal door, by which the stove is supplied with fuel. Through one side of the stove are several small apertures for the induction of air; and attached to the opposite side is a funnel for the eduction of smoke. Steam-pipes, gauge-cocks, &c. may be attached to either of the pipes or cylinders, as may be most convenient.

I claim as original the arrangement of the cylinders, the method of attaching them to the pipes, and that of connecting the side-pipes with the cross-pipes.

Yours, respectfully,

RUFUS PORTER.

Billerica, Mass., Aug. 22, 1834.

The Mechanics' Institute of the City of New-York.

To the Editor of the Mechanics' Magazine:

Sir,—As the commencement of the annual course of lectures of this Institute is fast approaching, and as I have reason to believe there are still a large number in this city who have little or no idea of the advantages to be derived from being a member of this Institute, in consequence of their not understanding its true character and object, I take the liberty to address to you this communication, with the hope that it may be the means, through the medium of your Magazine, of calling the attention of mechanics in general to the nature, object, and advantages, of the Institute above named.

The grand aim and object of this institution is to place within the reach of the mechanic that scientific knowledge so much required in almost every mechanic art, but which, as yet, is for the most part monopolized by those alone who are capable of sustaining the expense of a college.

The value of scientific knowledge is, perhaps, greater with the mechanic than almost any other person, because it is of constant use to him. In whatever art he may be engaged, the various facts of science are constantly presenting themselves to his view, but, alas! too often are they a dead letter to him. He sees them, and often, too, in their rarest and most interesting forms, but he is only delighted with the phenomena without being instructed; he has never trodden the paths of science, and consequently is incapable of improving, by what he witnesses, either his mind or profession—and thus his ignorance causes him to perpetuate error. Since a knowledge of the physical sciences is of such inestimable value in all the various mechanical pursuits of man, both for their improvement and successful prosecution, and since the improvement of human happiness is in a direct ratio to the progress of man in the acquisition of useful knowledge, it is the duty of every man to grasp all the science within his reach; and it is the duty, and one of the first duties of a Government, to establish such a system of education as will place a knowledge of every useful branch of learning within the reach of *all*. But where do we see such a system? Not in America,

"The land of the free, and the home of the brave."

We have our common schools, true; and alas, nine tenths of those who get any education at all are furnished with an education no better than that of a common school! What is the education of a common school? Is there a syllable of science taught in one, beyond the rudiments of mathematics? No. What then do nine tenths of our population know when their education is finished? Simply to read, write, and practice the rules of common arithmetic! With the view of carrying the mechanic to something beyond the mere knowing how to read, write, and "cipher," the Mechanics' Institute of the City of New-York was established. It was intended as a school for teaching the most useful branches of physical science—to admit the mechanic into the lecture room of the college, and at a charge within the reach of his income.

Among the names most conspicuous in the history of this Institute is that of Professor Steele, of Scotland, who was among the first to propose its establishment. The first course of lectures on Natural Philosophy was delivered by this learned and highly esteemed gentleman, during the winter of 1831–32, with ample apparatus, and in a manner which gave perfect satisfaction. During the winter of 1832–33 the same gentleman delivered a course of forty lectures on Mechanical Philosophy and Chemistry, to which he added, *gratuitously*, a course on Mathematics. During the same season a course was also delivered by another gentleman on Anatomy and Physiology. During the last winter the annual course was delivered by Professor Ellet, of Columbia College.

The lectures are given from twice to three times a week during the winter months, and the advantage to be derived from them, delivered as they are by a professor, with all the requisite apparatus, and the various subjects stripped of the technical language of the schools, and adapted to the most common capacities, is very great, saying nothing of the real pleasure one takes in listening to the lecturer on subjects new and full of wonders. The fatigue of the body from the labors of the past day are forgotten in his attention to the highly pleasing and instructive demonstrations of the lecture room; and when the lecture is finished, he is impatient until the next lecture evening arrives. Besides, the young mechanic is kept from the thousand vices and temptations of a large city like this; and while he is improving his mind, and storing up useful knowledge at the lecture room, he is also contracting a habit of reading and study: for the lecture, when finished, is not neglected. It is a practice recommended by the lecturers, and, I believe, generally practised by the members, especially the younger ones, of reading books on the subjects lectured upon;

and thus, instead of wasting their leisure hours in all those idle vicious pleasures which, while unengaged, they are liable to be led into, their evenings are spent in reading, and in acquiring a respectable acquaintance with those branches of science most necessary in life, most instructive, and most interesting. They obtain for a mere trifle, by a punctual attendance on all the advantages held out by the institution, that valuable information which wealth, as yet, has been able to furnish, and which no institution as yet established, either by State, or General Government, for the diffusion of knowledge among the indigent, furnishes.

That the reader may obtain a better idea of this institution than the above remarks may furnish, I will here give its constitution entire.

CONSTITUTION.

Section I. Art. 1. This Society shall be denominated THE MECHANICS' INSTITUTE OF THE CITY OF NEW-YORK.

Art. 2. Its object shall be the instruction of Mechanics and others in popular and useful science, and its application to the Arts and Manufactures, by means of lectures, apparatus, models of machinery, a museum, and a library.

Section II. Art. 1. This Society shall consist of an unlimited number of members, who shall be divided into two classes, namely, regular and life members.

Art. 2. Any person paying *twenty-five dollars* may become a life member, provided he is recommended and chosen in the same way as regular members, and such life members shall not be called upon for any annual payments.

Section III. Art. 1. The officers of this Institute shall be a President, two Vice Presidents, a Recording Secretary, a Corresponding Secretary, a Treasurer, and twelve Directors, to be elected annually by ballot—the persons having a majority of votes shall be declared duly elected; provided, however, that no member whose dues shall remain unpaid for more than twelve months, (unless he shall have been exempted from payment by a vote of the Society,) shall be allowed to vote at any such elections.

Art. 2. The President, Vice President, Secretary, Treasurer, and Directors, shall constitute a Board of Directors, with full powers to appropriate funds, (under the direction of the Society,) and generally to conduct the affairs of the Institute. Not less than two thirds of this Board must be operative mechanics.

Art. 3. The Recording Secretary shall engross in a book, to be kept for that purpose, the minutes of all the transactions of the Society, the names of the members, of donors, and all other matters requiring to be recorded. He shall also receive all dues and donations in money, and pay the same over to the Treasurer, and take his receipt for the same; and shall also make out a report quarterly, and exhibit it to the Society; and post up the names of all persons proposed as members in the place designated for that purpose.

Art. 4. The Treasurer shall receive all dues and donations in money from the Secretary, and give a receipt therefor; pay all drafts on him when signed by the Secretary and countersigned by the President; keep a regular account of the financial concerns of the Institute, an abstract of which, accompanied with satisfactory vouchers, he shall exhibit quarterly, and at such other times as shall be required.

Section IV. Art. 1. Every person on becoming a member shall subscribe this Constitution and pay the sum of *two dollars;* and every member shall be subject to an annual payment of *two dollars,* which shall be paid on the first meeting in October, or before a member receives his ticket of admission to the lectures.

Art. 2. The initiation fee may be increased in proportion to the increased value of the property belonging to the Institute; but this cannot be done except by a resolution passed at a general meeting.

Art. 3 The Institute will gratefully receive donations of money, books, apparatus, models of machinery, drawings, or natural and artificial curiosities, which donations, together with the names of the donors, shall be registered in the books of the Society kept for that purpose.

Section V. Art. 1. An annual general meeting of this Society shall be held on the second Monday evening of April, to audit accounts, elect officers, and transact other business connected with the Society.

Art. 2. The annual tickets of regular and life members may be transferred; but persons to whom they are transferred shall not be admissible to any office or vote; the management of the Institute being invested in the regular and life members, who are eligible to any office, and entitled to vote on all questions connected with the Institute.

Art. 3. In order to preserve the harmony of the Society, nothing of a religious, irreligious, or political tendency shall be admissible, on any account, at any meeting of the Institute.

Art. 4. In order to make the Institution as generally useful as possible, any person shall be entitled to the privilege of reading from the library and attending the lectures, or any other course of instruction that may be given in the Institution, for one year, on paying such a sum as the Society shall determine; but such person shall not be entitled to any share in the management of the Society, can be eligible to no office, nor entitled to vote on any question whatever.

Art. 5. This Society shall be permanent, and its property unalienable, but each member shall possess the power to transfer his share, provided the person to whom he transfers is approved of by the Society in the same manner as admitting new members.

Art. 6. Any proposal to alter or amend this Constitution must be made in writing, and subscribed by at least ten members: it must be delivered to the Secretary, who shall read it at the first regular meeting, after which it shall lie over for discussion, and the proposed amendment finally adopted or rejected by a majority of the members present, the votes being taken by ballot.

For further information to those who may wish to become members of the Institute, I add the following from its by-laws:

MEMBERS.

Sec. 1. Persons wishing to become members must be proposed at least one meeting previous to being ballotted for; and all candidates having a majority of the votes of the members present, shall be declared duly elected.

Sec. 2. Every member on payment of the initiation fee shall receive a card, which he shall produce, if required, as proof of membership; but no member shall be entitled to the privileges of the Institute whose dues shall be in arrears.

Sec. 3. The Institute may expel any member,

whose dues,&c. have remained in arrears for a longer period than one year.

Attached to the Institute is a small but well selected library, and a reading room, furnished with books, newspapers, periodicals, &c. &c. all of which are free to the members. The *sole* expense of each member, after paying the initiation fee, is *two dollars* each year, a sum so exceedingly moderate as to prevent no one from being a member. The present number of members is between four and five hundred.

This institution, as an instrument for the promotion of virtue, for diffusing throughout society those principles of morality which are the foundation of universal concord, of public as well as of private peace, unanimity, and happiness, deserves the particular regard of every lover of liberty, every true patriot, and every genuine philanthropist. Virtue is a general consequence of knowledge, and vice the absence of it; and, therefore, every institution for the diffusion of the one operates as a check to the other. The establishment and success of such an institution is an unequivocal and encouraging sign of the times—it shows that the advantages of knowledge are seen and deeply felt, and that too by the most useful and numerous class of citizens. It shows that a degree of energy, which will overcome all the obstacles to a participation in the pleasures and advantages of science, exists in that part of our population to whom science is of the most importance, but who have the least of it, and who, for any thing we see in the present state of things, must continue to have the least of it, unless they combine their efforts, and thus obtain that which legislative power as yet denies them.

Your obedient servant, A.

[We cordially agree with our esteemed correspondent as it regards the utility of the "New-York Mechanics' Institute," *even as at present conducted.* We have been long of opinion that there is not sufficient of popular science introduced by the lecturers and managers of that institution, and they would do well to bear in mind, that there are other modes of instruction than lectures. We wish they would follow the example of the "London Mechanics' Institution," and establish classes for self-instruction in the various sciences; that course has been of great benefit to many of the members of that institution. Nor do they confine themselves to science: they have classes for learning the French, Italian, Spanish, and other languages, &c. &c. We throw out these hints with every good feeling towards the success of the society.—Ed. M. M.]

On the Comparative Value and Importance of Mathematical Science, and on the Pretensions of its Professors.

[From the London Mechanics' Magazine.]

Sir,—Whilst occupied in writing a reply to Kinclaven, I was led to indulge in some observations on the intellectual grade and practical value which ought to be assigned to mathematical acquirements, and on the overweening pretensions of some of the mathematicians; but these remarks became so much extended under my hand, that I have thought it best to give them to you under another form.

I am sir, yours respectfully,
Benj. Cheverton.

Men's minds appear to be differently constituted in regard to the investigation of things. Whilst the generality take a view of a subject merely as a particular case, and reason upon and examine it only as connected with its more immediate causes and consequences, the profound inquirer analyses it, to discover the law or principle which pervades it in common with many others; to trace and connect it with those of dissimilar aspect; to show that in the abstract they belong to one common truth, though in the concrete, or in their actual existence, produced by the modifying agencies of their peculiar circumstances, they present appearances which apparently have no relation to each other. Such are the minds who have for their high aim the extension of the principles of knowledge; but though peculiarly fitted for discovery, they are not the best qualified to bring science down to practical application, or even to make it literally accord with matter of fact. In disentangling the complications resulting from concomitant agencies, they are so intent on arriving at the most general truths, so systematically disregardful of the separate consideration of those agencies, and so much in the habit of keeping the analysis disencumbered of all ideas not comprised in the upward leading train, that when, by a course of synthetical reasoning, they would turn their discovered principles to account, and build up a system on their foundation, they too much exclude the operation of the subordinate laws which concur in influencing, and more immediately regulate, the ultimate result, and which give to things the form and appearance which they present. Their conclusions, though correctly drawn, are true only in part, and by assumption and limitation, true mentally, but not materially, or as found in actual existence.

But there is another class of minds of

nearly the same stamp and mould as the former, who, though not taking the like grand and original views, are yet of a kindred spirit. The former act the part of pioneers, but these take to the circumstantials, and bring into subjection what the others merely pass by. They fill up that outline of a science or system which the former, in the discovery of its most general law, was content merely to trace; they bring the analysis to bear on all the relations implicated; weigh, balance, and proportion the conflicting agencies; and are thus enabled to perfect the subsequent synthesis in all its details, to take a complete view of the subject in all its parts, and a comprehensive one in all its bearings, and to bring forth to view the modified results, the exceptions and the anomalies, as illustrations of, and confirming attestations to, the fraudulent truths which at first sight they may appear to invalidate.

Both these classes of men are philosophers, the distinction between them having reference to a tendency to generalize, rather than to the usefulness of their labors, or the rank in which they ought to stand; but they *may not* be mathematicians, that depending on the circumstance whether the science of quantity is required in their investigations. These last, therefore, form a third class, whose object is less the extension and perfection of science or system, than the cultivation of the means thereof, so far as the relations of quantity are concerned.

The mathematicians—I mean mere mathematicians—are doubtless valuable members of the body scientific, but some among them, (the least generally informed,) are sadly inclined to over-estimate the honor of their station, and the comparative value and importance of their labors. In the great field of science, to say nothing of the greater field of knowledge, they occupy merely one of its sections, they facilitate and abridge the work of some, and co-operate in the work of others; but they are neither the pioneers nor the finishers of the operations going on around. Subsidiary and assistant to original investigation, the *science of quantity* is of important service, but if put forward and esteemed as the *science of things*, it is worse than useless, and many who might have made good philosophers, have been spoiled by the false glare reflected from their own doings being taken for the true light thrown on Nature's works. The lines and characters with which mathematical operations are conducted, and whose results, though only abstractions, are too often confounded and identified with realities, are not only the mere symbols of things, but the symbols merely of one or two qualities in things; and therefore, though the conclusions are true, rigorously true, as to the signs, they are false as to the things themselves, when regarded in their ultimate modified results, from the influence of those qualities or accidents which the mathematician does not or cannot symbolise—which he does not, because the complication arising from their reciprocal actions exceeds and defies his means—which he cannot, because in regard to some of them there is not sufficient analogy in the types to warrant the deductions they afford being transferred to the archetypes. Even as to those said qualities (extension and individuality) which form the subject matter of mathematics, the investigation is often limited, and therefore imperfect, from the impossibility of extending the analysis to all the ramifications which branch forth from it. The mathematician arrives at the truth, and nothing but the truth, but not at the whole truth—not even at the whole of the only kind of truth which symbols give. When, however, the case is so simple that the investigation comprehends all the possible relations belonging to those qualities, and the only result sought for in things is a knowledge of those relations, then it may be said, and only then, that the conclusions of the science are not only indubitable, but identical with realities—but what does not this limitation exclude?

The mathematician has a little, a very little, world of his own, in which every thing is in the utmost order, subject to known laws, involving definite and foreseen action, liable to no interference not calculated on and provided for, and the whole capable of coming within his own powers to regulate and govern according to assigned rules; for things which cannot be made amenable to his jurisdiction are ejected from his dominion. He therefore admits nothing of unknown power, or which may exert an influence which he cannot see, and introduce uncertainty and casualty within his precincts. Hence, also, many agencies, though well understood, are rejected by him, lest they should prove too numerous for his perfect cognisance, and lest more subordinate laws should obtain than he can see and understand their bearings; or else he accepts only the first modifications which they may produce, and then casts them out altogether, whereby he avoids the many puzzling anomalies and exceptions which would proceed from their mutual actions. Hence, also, he ejects, as they arise, whatever among the collateral effects may complicate and embarrass the more direct train of results. Thus he sees and compre-

hends every thing, the whole is within his grasp, demonstration attends him at every step, aberrations are impossible, contingencies are out of the question, all results are naked to his sight, and his prescience embraces all, because his knowledge is certain and perfect, and extends to all. But, on the other hand, this is a world of curtailment and exclusion, in which nature is deprived of her just proportions, and of many of her endowments—it is a world of meagre forms and distorted shapes; and thus feeble man, failing to stretch his powers to a comprehension of the full length and breadth and depth of things, makes the things themselves conform to the extent of his own puny faculties, and then, in all the self-sufficiency of pride, exclaims—behold! this is nature!*

When the mathematician comes forth from this tiny world of his into the world of realities, he is bewildered with the multiplicity of its objects, he is confounded with the immensity of their relations and mutual aspects. He looks for certainty, and can scarcely find probability. Accustomed to demonstrate, he is unqualified to estimate; and in the habit of concentrating his attention to a single, unbroken, unerring, and necessary chain of inferences, and having the power permanently to record its every link, and fix the otherwise fleeting convictions of certainty, he is unfitted to retain a steady and expansive view of several collateral lines of action, to balance conflicting influences, to adjust their proportions, and from the whole to educe the nearest to the true conclusion which only actual results can make to appear. Emerging from his world of abstract ideas, if indeed it be so much as this, he finds the real world, and the things thereof, to be a perfect enigma. He can follow, it may be, in the track of those who have unravelled it a little; but he has no powers of himself to unravel it further. Desirous, however, of doing something, though it may be only after his own method, suiting, therefore, the subject to his means and habits, he seizes a few of the most manageable facts; and if they are not to him already isolated, by his ignorance of the ties by which they with all things are bound together, he takes care to sever their connection with disturbing causes, and to rid himself of all embarrassing extraneous influences. If his facts are not sufficiently fruitful of principles, he can eke out his case with a few postulates; and if they are untractable, he can frame an hypothesis which shall present as nearly as possible the same appearances. He then proceeds in the most lucid and masterly manner, to build his system scientifically. All its parts are in harmony, all its conclusions are demonstrable. His penchant for clearness, order, and certainty, is gratified, and he fondly flatters himself that the results which he brings forth are conformable to nature. He does not consider that the harmony and clearness which he so much admires, gives every reason to suspect that he is entirely wrong; for the one may arise from every element of discord being rejected, and the other from those narrow and contracted views, which, by reason of our limited faculties, we are only able to take when absolute certainty is to be the result. Professor Sedgwick, whose scientific pursuits tend to enlarge and expand the mind, has a just observation in a recent publication of his, which, though having an immediate application to one particular subject, is by no means foreign to the tenor of the present remarks: "To suppose that we can reason up to a First Cause in moral questions—that we can reach some simple principle, whence we can descend with logical precision to all the complicated duties of a social being, is to misapprehend the nature of our faculties, and utterly mistake the relation we bear both to God and man. Such a system may delight by its clearness, and flatter our pride, because it appears to bring all our duties within our narrow grasp; *but it is clear only because it is shallow, while a better system may seem darker only because it is more profound.*" Thus, the mere mathematician is disqualified by his prejudices, his habits, and the tutored bias of his mind, to look at the world of nature as it is. For, however paradoxical it may appear, views may be taken of it, which, though less exact than his, may be more complete, and though less certain, may be more probable. He is really better qualified to comprehend an entire system of worlds, so far as it may be explored by others possessed of a superior order of intellectual gifts—for the only point of view in which he can regard them, is merely as individual entities, whose dependence on each other is governed by one universal law of influence, and whose aberrations and disturbances, therefore, are not in the main beyond his scope. But in respect to mundane affairs, he has not the *coup d'œil*, the tact, or the *intuitive* perception, as it appears to be—though it is not that, nor is it innate, except so far as natural aptitude is concerned; but it is a deliberate process, and an acquire-

* The arrogance of some of the naturalists is astonishing. They sit in judgment on nature, criticise her works, and talk of the attempts in which she has failed to perfect her plan. After all that has been said of the inductive philosophy, and of our being the humble disciples of nature, the race of the king of Castile is not yet extinct.

ment derived from long habituated reaches of comprehensive thought, and faculties well disciplined by suitable practice—he has not, I say, that fine *eventual* perception, as it may with more propriety be called, which includes the whole implication of things, their mutual actions, and their final issue, whereby others are enabled to combine vastly, if not minutely, to establish something like order and gradation in the gross, if not in the detail; to foresee with a degree of certainty, though it may be with some obscurity; and to catch the shadows, if not the lineaments, of unknown forms. Such powers in any perfection are not often combined with high mathematical attributes, for they are of diverse tendency; but when they are united and directed with a combined effort to connect systematically the wide survey with first principles, they mark not only the true but the pre-eminent philosopher. Such was Newton. In his profound inquiries into the phenomena of nature, requiring new methods of mathematical investigation, his merits in that respect are, no doubt, eminently conspicuous; but yet, as the founder of a system, it is not so much the mathematician as the philosopher which shines forth in him. What a contrast there is between him and Descartes. With what sagacity he brought to light slight and hidden analogies, and what wisdom is displayed even in his scholia and his queries. His very conjectures partake of the nature of science. How extraordinary was that concerning the diamond; and who can say that his idea concerning the cause of gravitation may not yet be verified, or at least rendered highly probable?

The tendency of mathematical studies to unfit the mathematician for the general study of nature, and for investigation into the complex structure of human affairs, has now been stated—in very general terms confessedly, but that of course was unavoidable, unless there was an intention to write a complete dissertation on the subject. There is, however, another cause which lies at the root of that unfitness, peculiar to the mere mathematician. It consists in the very structure of the mind, that is, in the inequality of his faculties. "In almost all the instances of mental superiority," says Dr. Chalmers, "it will be found that it is a superiority above the average level of the species in but one thing—or that arises from the predominance of one faculty over all the rest." We may extend this remark, and say that nature is seldom perfect in opposite directions in the same individual, and that if her bounty flows strongly in any particular channel, it is generally at the *expense* of the diverging streams. This is so remarkably the case in regard to the mathematician, that deficiency in judgment is proverbially ascribed to him. Now judgment, in a popular sense, is a collective word for the several faculties which concern not the abstract ideas, but the realities of things in their actual forms. Thus both the congenital deficiency and the predisposition mutually concur with the habit which they produce to make the mere mathematician what he is—utterly unqualified to investigate any thing out of his own province. But properly to establish the point of his *natural* inaptitude would lead me too far into metaphysical, and, as some would think, into phrenological disquisitions.

Nature may, in some instances, bestow her gifts with as balanced as a bounteous hand; but then the study of mathematics, in all its fullness, is so engrossing, demanding so large a portion of time, as to preclude the generality of its students from the acquirement of that extensive knowledge of things and their relations which is necessary to furnish the philosophic mind. "Mathematics," says Duncan in his Logic, "is an engaging study; and men who apply themselves that way so wholly plunge into it, that they are, for the most part, but little acquainted with other branches of knowledge. Even such as are alleged to have excelled in their own profession, and to have discovered themselves perfect masters of the art of reasoning, have not always been happy in treating upon other subjects; but rather fallen short, not only of what might naturally have been expected from them, but of many writers much less exercised in the rules of argumentation. Because, however perfect they may be in the art of reasoning, yet wanting here those intermediate ideas, which are necessary to furnish out a due train of propositions, all their skill and ability fails them, for a bare knowledge of the rules are not sufficient—we must further have materials whereunto to apply them."

Barbeyrac, in the preface to his translation of Grotius, "De Jure Belli et Pacis," informs us, says Kirwan, that a mathematician undertook to refute it; but of this refutation he says, "on n'a jamais rien vu de plus pitoyable, et on seroit surpris qu'un mathematicien put si mal raisonner, si l'on n'avoit d'autres exemples bien plus illustres, qui montrent clairment que l'etude des mathematiques, ne rend pas toujours l'esprit plus juste en matiere des choses qui sont hors de la sphere de ces sciences." And Condillac, according to the same author,

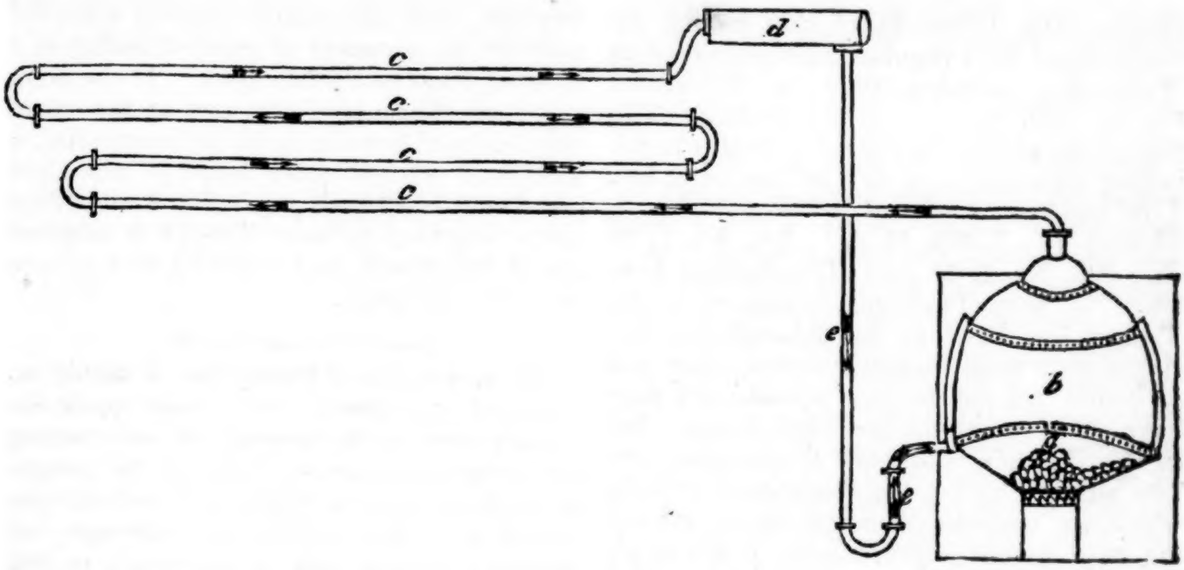
says, "nous avons quatre metaphysiciens celebres, Descartes, Malbranche, Leibnitz, et Locke; le dernier et le seul qui ne fut pas geometre, et de combien n'est il pas superieur aux trois autres?"

It cannot, however, be denied that a few mathematicians have been philosophers; or, rather, that some philosophers have also been mathematicians. Men possessed of an equilibrium of the faculties, and endowed with sufficient energy to sustain and invigorate them all—men of panoramic as well as of microscopic vision—men who extend their views beyond the mere rules, the elegant abridgments, and the ingenious artifices of the science, and who, valuing them only as means to a nobler end, merge the powers of the analyst in subservience to the grand objects of philosophy. It is from men like these that the mere mathematician has received a reflected lustre, and a consideration which is not his due. But the far greater number of philosophers, and the most useful ones too, have *not* been mathematicians. To instance only in our own time, and without adverting to living characters—having regard only to one branch of physical science, that which concerns the intimate nature and constitution of bodies, and passing by the various other departments of philosophy, such as morals, economics, physiology, geology, and the like, we may mention the names of Priestley, Franklin, Davy, and Wollaston.* It is probable that most of our eminent philosophers may have had some slight general knowledge of the mathematics, such as even our practical men commonly possess, and such as becomes a liberal education. They may have run through Euclid just as they may have run through Homer; nay, they may have done more than this, without being mathematicians any more than they were Grecians. This, in particular, may be said of the last-mentioned philosopher, though I believe so much even cannot be affirmed of the others. Even among our engineers, whose pursuits would seem to make mathematical acquirements more requisite, the most eminent, such as Smeaton, Watt, Rennie, and Telford, have not been distinguished by any beyond the merest common-place. Many of their compeers have advanced much farther in these routine attainments, and yet wanted that tact, that fine superior sense, which is far more indispensable to the man who has to take and deal with things as they are, enveloped in all their circumstances, and subject to all their qualities and contingencies. Sir John Herschell observes, that "almost all the great combinations of modern mechanism, and many of its refinements, are *creations of pure intellect*, grounding its exertions upon a very *moderate number of elementary propositions* in theoretical mechanics and geometry." In what have the pupils of the *Ecole Polytechnique*, who are all mathematicians, excelled our own engineers? Let the fate of the first suspension-bridge at Paris tell. We have yet to avail ourselves of the eminent services which the high mathematical attainments of the pupils of our own school of naval architecture were to render to the science—if science yet it be. What has been the result? Does even the Surveyor of the Navy put forward any scientific pretensions? Has he not been selected out of another profession? Has the professor of the school himself succeeded better, or so well, as the unpretending shipwright who built the Pearl? Let it not, however, be understood, that the school has not sent forth able and useful men, or that they have received rewards equivalent to their merits. But it is maintained that in this, as in many other cases, the tentative method has been, and perhaps ever will be, of more value than science, and that those qualities of the mind for which I have contended, and which science cannot give, are superior to and more indispensable than mathematical attainments; and this may be said without condemning the application of analysis, as far as may be, to the successful results which experiments on a large scale may have produced. In such analysis, indeed, if sagaciously and not too rigidly and scientifically conducted, those superior qualities will appear, just as they do appear, in the rough empirical sort of analysis which the successful though unpretending shipwright calls to his aid. Those among the students who are in possession of these natural gifts, will break through the prejudices and pedantry which a too engrossing attention to mere science creates, and keeping it in its proper place will make it secondary or subservient to a comprehensive view of their peculiar and very complicated subject, satisfied, if they cannot mark and estimate all the concomitant influences, in a manner so precise and determinate as they could wish, that they at least form their conceptions and draw their conclusions in conformity to the *truth* of things.*

(*To be continued.*)

* We have Mr. Babbage's authority in regard to Dr. Wollaston.

* Let this be exemplified by an able article which appeared within these few months in the "United Service Journal," written, I believe, by a pupil of the school above mentioned.



Notice of a Hot-Water Apparatus, invented by Mr. John Darkin, Engineer, Norwich.

Having observed a paragraph respecting this apparatus in a Norwich newspaper, we wrote to Mr. Darkin, who, with commendable liberality and promptitude, sent us the annexed letter and sketch. The system adopted appears to be similar to that of Mr. Perkins, but at a temperature not exceeding that of boiling water.

"In reply to your inquiry, I cannot tell whether my hot water apparatus differs from all others in use or not, never having seen a single design of the kind until after I had constructed my own; and since that time I have only read the accounts of those which are described in the Gardener's Magazine. I have derived much amusement from these, from observing that other attempts have been attended with similar difficulties to those which I had to encounter, before I could get this apparatus to act to my wishes. I have great pleasure in sending you a description of it, in order that you may judge of its merits; and if you think it likely to afford additional hints, and to be deserving of a place in either the Gardener's Magazine, or in the Architectural Magazine, it is very much at your service.

"The apparatus consists of a furnace, a boiler, cast-iron tubes of any diameter, an expansion tube, &c. as shown in the accompanying sketch. The tubes may be connected with the boiler, in any way which circumstances require, and carried in any direction, so that they do not descend below the level of the bottom of the boiler. It being understood that a given number of superficial feet of tube will throw off a certain quantity of cubic feet of hot air per minute, it can easily be ascertained by the admeasurement of the house, and the quantity of glass in it, what quantity of tubing is required for it.

"I need not enlarge upon the efficiency and economy of my own plan of warming, as you will be a competent judge of its qualities by my description of it. It certainly has a decided superiority, in every respect, over the common mode of heating by flues, and particularly in retaining *the required temperature* with a small consumption of fuel, and very trifling attention. Boiling water is much to be preferred to steam heat. My own green-house, in which the apparatus is constructed, loses but a few degrees of heat by allowing the fire to go out for six or eight hours in the night. A short time is sufficient to make the water boil again, when it expands and displaces the cold water in the tubes, which are immediately supplied with hot water from the boiler, the cold water retiring through the expansion tube down the returning tube, whence it is heated and again projected forward; thus keeping up a continued circulation of hot water through the tubes for a considerable time, even after the fire has been allowed to die out.

"This apparatus can be applied with the best effect to horticultural and public buildings of every description, mansions, offices, warehouses, drying rooms, &c. &c.; and, as the tubes have no connection with the fire, not a particle of burned air is communicated by them to the room in which they act."—[Loudon's Magazine.]

Mr. Russell's Steam Carriages.

[From the Edinburgh Observer.]

Through the medium of a letter received from Glasgow, we are happy to record the great and increasing success of these car-

riages. Our friend writes, that having recommenced their regular business-career on Wednesday morning, they ran throughout the day with the utmost punctuality. The rate of speed may be judged of from the following statement sent us: 1st carriage, No. 4, 30 minutes; 2d, No. 4, 34 do.; 3d, No. 3, 45 do.; 4th, No. 3, 46 do.; 5th, No. 1, 25 do.; 6th, No. 1, 25 do. The distance here taken is from Tradeston, Glasgow, to the Tontine Inn, Paisley; for although the carriages start from George's square, they are of course not put to their speed until they have got clear of the crowded streets; but as this distance is at least seven miles, the rate attained by the last mentioned vehicle, which we understand is the one containing the most recent improvements, is not much less than 17 miles per hour. Another circumstance, we are glad to hear, was that so highly have the public in that quarter already begun to appreciate this new mode of conveyance, that the carriages were overloaded with passengers the whole day. We observe, however, that the trustees of the Glasgow and Paisley road are by no means favorable to the undertaking, and have been for this week past busying themselves in laying down immense heaps of stones on all the ascents and *best* portions of the road, for the apparent purpose of obstructing the progress of the carriages, though hitherto without effect. This conduct, as might have been expected, is meeting with the general indignation of the people in that quarter.

[From the Glasgow Courier of July 1.]

We have much pleasure in noticing the last two days' most successful performance of the Glasgow and Paisley steam carriages. On Wednesday the carriages performed six trips, running every hour from ten till three o'clock, and yesterday an equal number. The carriages were crowded with passengers, and so great was the anxiety to obtain seats, that although there is accommodation for twenty-six, it was found impossible to prevent upwards of thirty persons from taking seats upon them. The average velocity of the carriage is twelve miles an hour, and the only impediment to a high rate lies in the extraordinary state of the road, which should at this moment be in the best possible condition, but has just been deeply bedded with broken stones, laid on in large masses, for the purpose of injuring the carriages. This is a line of illiberal policy, which it is hoped the trustees will not persevere in, as it cannot possibly in any way affect the success of the carriages, which will assuredly be carried through with advantage, while the road is thereby rendered unfit for the purposes of general traffic, at a great expense to a public trust. At the sixth trip upon Wednesday last, and as the steam carriage was coming up to the new metal, it was found that enormous heaps of stone had just been laid down; and the tremendous power requisite to bear through it smashed one of the wheels, and detained the carriage till it was replaced.

[From the Glasgow Herald.]

On the evening of Friday last, a highly interesting experiment was made upon the Paisley road for the purpose of ascertaining the comparative merits of two of the company's carriages upon different constructions. A little after six o'clock the carriages left George's square, with a full supply of fuel and water adequate for eight miles. The carriages proceeded together through the crowded streets, as rapidly as safety would admit, and along the Paisley road to a point a little beyond the two-mile house, where they turned and started together. After keeping exactly together for about a quarter of a mile, the carriage on the improved construction began to show a manifest superiority, and rapidly distanced the other; and on arriving at the Gorbals, Glasgow, had gained half a mile, having done the whole distance in seven and a half minutes, while the latter required ten minutes. The same carriage had, on the previous Wednesday, done the distance from the Tontine at Paisley to the Gorbals of Glasgow, being seven miles, in thirty-three minutes, including stoppages.

[From the Glasgow Courier of July 4.]

On Wednesday the steam carriages commenced running every hour, with passengers and luggage; and they have since been plying with the most triumphant success. The carriages start from George's square a little before the hour, and proceeding down Queen street, take up passengers at the foot of it, and starting from the head of Maxwell street they pass through Tradeston, where they again take up passengers. This generally occupies about twelve or fifteen minutes; and the seven miles to Paisley are then done in thirty or thirty-five minutes. A few minutes are thus left to take in a supply of water and fuel, with the complement of passengers, at Paisley; and at the succeeding hour the same carriage again returns to Glasgow.

We also noticed in our publication of Tuesday the *kindness* with which the road trustees, at the Glasgow end, has accommodated Mr. Russell's carriages at their own expense (or that of the public), with a suffi-

cient quantity of new metal, to try their powers; but we have since discovered that this *kindly disposition* has been carried a little too far, and that having found the carriages more than competent to the task of ploughing through the stratum of broken stones, previously laid down, they employed a large number of men on the following day, to lay down another stratum of equal thickness on the top of the former, rendering the road scarcely passable to any heavy load. Finding this expedient also ineffectual, we learnt yesterday that horses and carts and a number of men had been engaged during the whole of the night in laying down loads of broken stones, to such a depth that they were obliged to cut away the bottom of the toll-gate in order to allow it to close over the mass.

The difficulties surmounted in bringing these vehicles to the perfection here indicated, and the qualifications of the inventor, are what scientific persons alone can duly appreciate; and we certainly cannot furnish our readers with a more striking estimate of both than by quoting the following observations from a very able paper on "the relation between a machine and its model," by Mr. Edward Sang, teacher of mathematics in Edinburgh, and which we find in the Mechanics' Magazine for January last:

"At the surface of Jupiter, a steamboat of 20 horses power would be unable to move—at the surface of our earth, one of perhaps 1000 horses power might perform pretty well; but at the surface of the moon, they might be made of perhaps 20,000 horses power—supposing the pressures of the atmospheres in the three cases to be alike. On Jupiter, a steam carriage would be an absolute chimera; *on the earth, it is barely possible;* but on the moon, nothing would be more usual. An intensity of gravitation, slightly greater than that which the earth exerts, would altogether preclude the hope of obtaining a locomotive engine. As it is, on flat railroads they perform well; as the road becomes inclined, they become less practicable; *and on common roads, nothing but the most consummate skill in the selection and in the use of the material, as well as in the contrivance of the parts, can ever be successful in their construction.* Security demands strength, strength requires weight, weight increases the friction, friction calls for additional power, and power can be procured only by an increase of weight. *To reconcile these conflicting claims is not the task for a beginner in mechanical contrivance, but for one well versed alike in the theory and in the practice of the arts.*"

Tunnel under the Ohio.—A writer in the Cincinnati Journal recommends the construction of a railroad under the Ohio river, opposite that city. The following is an outline of the plan:

The railway is to consist of two semi-ellipses, one above and the other underneath. The height of the upper arch to be 10 feet, and the lower 3 feet, and 24 feet in width inside, making the ellipse 13 feet high and 24 feet wide in the clear. The arch to be composed of cut stone masonry two feet thick. This arch is to be buried in the ground just sufficient to protect it from the action of the river. A floor composed of timbers laid lengthwise, on the bottom of the arch, and covered with planks, forms the carriage-ways and side-walks. The carriage-ways to be each 8 feet wide, and the side-walks each 4 feet wide. The side-walks are a little raised above the carriage-ways. The stones composing the arch are to be cut so as to form segments of the ellipses, and laid in hydraulic cement, and made as near water-tight as practicable. Notwithstanding all the care that may be taken in the construction, yet with a pressure, in time of high water, of 4375 pounds upon each square foot of the arch, the water will percolate through in such quantities as to require an engine to keep the road dry. It will of course be necessary to light the interior when opened for travel.

Between high and low water marks, there is a difference at this place of about 63 feet, and allowing the top of the arch to be 7 feet below low water in the bed of the river, and placing the bottom of the arch at each end, at high water mark, will make the total descent 83 feet. It is thought that one foot ascent in twelve feet horizontal distance is the greatest inclination the road will admit; consequently, the length of the inclined arch, from high water mark to the bed of the river, will be about 1000 feet; and allowing also that the bed of the river at low water is about 1000 feet wide, will make the total length of the road 3000 feet.

The only difficult point in executing the work will be in excavating the earth and rock below low water. It is quite practicable, however, in a dry season, at comparatively small expense, to enclose a space with a frame of timber and plank, made water-tight by placing bags of earth around the outside, and pump out the water with an engine placed upon a flat boat, until the excavation is completed and the arch formed within the space enclosed. Then by moving the same coffer-dam its length farther along, another space can be enclosed, and the work com-

pleted in the same manner, and repeated until the bed of the river is crossed. This part of the work will depend upon so many contingencies that no accurate estimate can be made of the expense attending it. The masonry of the arch and the flooring can be estimated with tolerable accuracy. The stone for the work can be obtained one hundred miles up the river, where extensive quarries are already opened. The cost of the masonry will be as follows:

Quarrying the stone per perch of 16½ cubic feet		...	$1 00
Delivering do. do.	do.	....	2 50
Cutting the same with three faces,	do.	....	2 25
Mortar of water, lime, and sand,	do.	....	50
Laying the stone, including centering,	do.	....	75
Cost per perch,			$7 00
Every 10 feet in length of the arch will contain 78 perches of masonry, which, at $7 per perch, will be			$546 00
Every 10 feet in length of the floor will contain 100 feet of timber, at 12½ cents per foot, $12 50 —220 feet of plank at 3½ cents, $7 70			20 20
Total cost of 10 feet of the road-way			$566 20

Which being multiplied by 300, for the length, will give $169,860 for the total cost of the arch and flooring. If to the above we add the probable cost of pumping the water and excavating the earth and rock for the road-way, and of covering the arch over again 3 feet deep, it will make the total expense not less than $210,000. To which should be added $20,000 for superintendence and expenses of the affairs of the company, &c. There can be no doubt that the stock in such an undertaking will yield a handsome profit.

It will be observed that a road-way, constructed upon the above plan, leaves the river entirely unobstructed; that the arch is completely out of the reach of injury from the river; that it is permanent, solid, and will last for ever; and that it involves but a trifling expense to keep it in order for constant use.

INTERNAL IMPROVEMENT. — *Great Railroad from New-York to Washington, through Philadelphia and Baltimore.*—The continuous line of railroad which is intended to run uninterruptedly from New-York to Washington, through Philadelphia and Baltimore, is undoubtedly one of the most magnificent works of the present day, either in this country or in Europe. In point of extent it far surpasses any line yet possessing the slightest prospect of completion in the United States.

The series of railroads from New-York to Washington, under different charters, granted by different States, which combined into one continuous line, uniting the two large and all the intermediate cities in question, could be completed, *but for one obstacle*, in probably one year or eighteen months. This obstacle is the small section of 26 miles between Trenton and New-Brunswick, in New-Jersey; a section which is indeed under the operation of a charter for one of the old fashioned turnpike companies, but does not, *at present*, possess those powers of transportation and management which are necessary to transform it into a railroad.

We have procured from the best sources of information a full and accurate statement of the present condition and prospects of the whole series of these railroads, which, combined, will bring New-York and Washington within eight hours distance of each other, and of course, all the intermediate cities in like proportion. This information is so interesting that we cannot deny ourselves the pleasure of communicating it to the public.

And first, the railroad from Washington to Baltimore. The length of this section is 37 miles, being a branch of what is called the Baltimore and Ohio Railroad, chartered under the joint powers of Congress, and of the State of Maryland. This road is now in the process of construction. A large section is finished, and it is believed that it could be completed in less than a year.

2. From Baltimore to Port Deposite Bridge on the Susquehanna. This section is also chartered by the State of Maryland--the stock subscribed, the route surveyed and located, and could be put under contract and finished with great expedition. The road is nearly straight and very level—the only exception being a very small sweep up Port Deposite Bridge. Length of this section 41¼ miles.

3. From Port Deposite Bridge to the Maryland and Pennsylvania line,—distance 10 miles. This section is also chartered, the stock subscribed, route surveyed and located, and only waits the action of the New-Jersey Legislature upon the Trenton and New-Brunswick section.

4. From the Maryland and Pennsylvania line to the Columbia Railroad, near Coatesville,—distance 20¼ miles. This section is also chartered, surveyed and located, being in the same situation as the two preceding sections. From Coatesville to the Susquehanna, the ground is particularly well adapted for a railroad. The line laid out runs along a gentle ridge, almost level the whole distance till it descends the bank of the Susquehanna. The ground resembles the famous ridge road of Western New-York.

5. From Coatesville on the Columbia Railroad to Broad street, Philadelphia,—distance 45½ miles. This is now in use. Not a word need be said of this section to a Philadelphia reader. It is crowded daily with passengers.

6. From Broad street, through the Northern Liberties, &c. to the Delaware river,—distance one mile. Nothing need be said of this short cut.

7. From Philadelphia to Trenton Bridge,—distance 26½ miles. This section we have already described. It is nearly completed, and will be ready for the locomotive before the termination of the season.

8. From Trenton Bridge to New-Brunswick,—distance 26½ miles. This is the only section throughout the whole line, from Washington to New-York, that is not chartered for a railroad. It is the construction of this section in which exists the whole obstacle to the completion of a line of railroad that would confer lasting benefits on the whole Atlantic seacoast—but of this, more anon.

9. From New-Brunswick to Jersey City, opposite New-York,—distance 30¼ miles. This section will be completed and ready for trade next year—more than half will be ready this season.

Thus, at one view, we have a continuous line of railroads through the whole route from New-York to Washington, a distance of 239½ miles, including the breadth of the North River, that could be constructed and made ready for travelling in about a year from this date, provided the Legislature of New-Jersey would remove the only obstacle that stands in the way of such a magnificent improvement.—[Phil. Inq.]

The Ohio and Chesapeake and Pennsylvania Canals, with a few subsequent Remarks relative to Canals and Railroads in general.

To the Editor of the Railroad Journal:

As an unfavorable impression may arise in regard to the above important improvements, by reading the remarks of "Civis," in the Journal of the 16th of August,* I take the liberty of giving some facts, and my views of the canals under consideration.

The Pennsylvania canal and railroad from Philadelphia to Pittsburg, at the head of steamboat navigation on the Ohio river, is about 400 miles. The Chesapeake and Ohio Canal, from Washington City to the same place, is expected to be about 350 miles. These canals must and will form the great outlet to the western trade bordering upon the great rivers of the west. The steamboat navigation to which these canals are connected is not less in extent than twelve thousand miles, and the country exhibits a population of not less than three millions of inhabitants, residing in the States of Louisiana, Mississippi, Missouri, Tennessee, Illinois, Indiana, Kentucky, Ohio, Virginia, and Pennsylvania; and from the great increase now taking place in this population, we may safely estimate the population in 1840 to four millions of inhabitants. Three hundred pounds would be a low calculation to assume as the average available tonnage from each inhabitant annually; but at this calculation, four millions of inhabitants will give an annual tonnage to the canals and other channels of commerce of 600,000 tons. Half of this tonnage must from indubitable circumstances pass through these great canals. Already have goods passed through the Pennsylvania Canal for the different States before enumerated, and circumstances indicate that, during the year of 1835, Pennsylvania will receive one million of dollars in toll from her canals; besides, being rapidly on the increase, will, as a revenue matter, outstrip the New-York canals as much as the relative proportion of population to which these canals give vent.

Already have I made it appear that 300,000 tons would necessarily pass the Pennsylvania and Ohio and Chesapeake Canals, should they be completed by the year 1840. Suppose this tonnage be equally divided betwixt those canals: 150,000 tons will pass through each, and at an average rate of $8 per ton, for toll, will give a revenue of $1,200,000 per annum to each, and this independent of that which will be derived from the inhabitants along those lines, which together will equal one million and a half as the revenue to each canal.

I have no doubt but two or three more years of experience on the Pennsylvania Canal will fully justify my calculations; and the Chesapeake and Ohio Canal will no longer linger for the want of funds, but capitalists will anxiously seek an investment in the stock of this company. This canal is estimated to cost about ten millions of dollars, and from the foregoing calculation, will yield, clear of all expenses, about twelve per cent. on the investment.

Thus far I have said nothing as to the relative advantages of canals and railroads. I have no disposition to disparage railroads as a means of communication; on the contrary, I consider them a valuable kind of improvement, highly beneficial in their place, and next to canals as a means of communication for the surplus products of our country, but *superior* to canals where travelling or speed is the great end to be gained.

I think it highly improper on the part of "Civis,"—who, it appears, does not understand the situation and probable effects of some of the canals of which he makes an unwarrantable assertion, that their stock will be unprofitable,—thus to attempt to injure improvements of a highly important cast, for the mere purpose of advancing a favorite system.

Let canals first be made from the Atlantic cities to the great western waters, and then railroads will follow in their train. The State of New-York has already arrived at the time when a railroad nearly parallel with her great canal is necessary in order to insure to her the paramount advantage which nature has placed at her disposal over the lake trade.

The canal, in a comparative sense, is the draft horse, while the railroad is the horse for speed. These in conjunction form every facility for an agricultural, manufacturing, and commercial community, of which they can be possessed as a means of artificial communication. They are or ought to be co-laborers in the great cause of advancing the social intercourse, and extending more widely the blessings to be derived from a free interchange of sentiment. The advocates of canals and railroads should therefore unite their interests; it

---

* See Mechanics' Magazine, vol. iv., page 127.

is no longer problematical as to the relative advantages of the two kinds of improvement.

Sufficient has already been done to satisfy every practical man wherein the great advantage of each improvement consists.

Yours, &c. L——.

August 26, 1834.

New Improvement in Washing Machines.—One would suppose that Yankee ingenuity had become well nigh exhausted upon washing machines: but we have lately examined a new invention, or rather a modification of an old system, by Mr. James Pullen, of China. His plan is upon the common fluted washboard, but his flutings are made of sheets of copper, zinc, tin—or they may be made of glass, earthen, or similar durable and smooth substances. These sheets or substances are fastened to boards, and used as such boards are commonly used. Now where's the improvement?—1st, In durability; 2d, In its smoothness; and 3d, Ease in performing the operation of rubbing. A common washboard does not last long—it soon gets rough, of course wears out the clothes and makes harder work; they get warped and split, are then patched up with shingle nails, which get rusty, and make a rickety, weak concern; the women scold, and the poor husband has to march off and buy a new one. The metallic rubber will last a long life time, if a little care be taken in drying it after using; for when worn a little on one side it may be turned and worn on the opposite side, and in the contrary direction.

We like the simplicity of the concern. Our washing machines have been too complicated. The inventors seem to have considered it necessary to show their skill in combining the greatest number of mechanical modifications in one piece; and the greater the array of cog-wheels, cranks and rollers, the more ingenious has the machine been considered, and the more likely to do its duty without hands. Disappointment has of course followed. This improvement is simple, and promises no more than it can perform. It does not promise to indulge idleness, and to do away the labor of washing; but to lighten and facilitate that labor, and render it a pleasure, rather than a dreaded task. Mr. Pullen has left one of them at our office for the inspection of those who wish to examine it.—[Maine Farmer.]

The Weather.—From the valuable table kept by Mr. McAllister, Optician, we have ascertained the following facts in relation to the heat in this city for the last ten years, during the months of June, July, and August. It may hereafter serve as a good table of reference.

The same thermometer, placed in the same situation, and in the shade, has been used during the whole period of time.

The day selected in each month has been that on which the thermometer stood highest at noon, at which hour the record was made.

1824	June 7th	97
	July 2d	95½
	August 9th	90
1825	June 21st	100
	July 22d	100
	August 15th	94½
1826	June 3d	94½
	July 13th	95½
	August 2d	90½
1827	June 20th	90
	July 3d	96½
	August 6th	99
1828	June 28th	96½
	July 24 & 25 each	95½
	August 1st	96
1829	June 20th	92½
	July 23d	96½
	August 14th	92½
1830	June 16th	93
	July 27th	97
	August 16th	94
1831	June 3d	96
	July 23d	96½
	August 17th	93½
1832	June 25 & 26 each	91½
	July 7th	93
	August 7th	93½
1833	June 15th	90
	July 22d	94
	August 14th	89
1834	June 7th	91½
	June 10th	96
	July 8th	98
	July 9th	98½
	July 16th	98
	July 24th	99
	July 26th	97½
	August 5th	95⅓

Average Heat of each month for ten years.

	June.	July.	August.
1824	81.3	86.2	79.8
1825	84.6	88.7	81.7
1826	82.5	85.4	82.7
1827	80.2	86.3	84.5
1828	87.0	87.1	85.8
1829	80.1	84.1	83.3
1830	80.3	87.9	83.0
1831	85.6	86.9	85.4
1832	80.3	84.9	82.7
1833	77.0	83.7	81.1
1834	81.4	89.5	

On Thursday, the 8th of July, between one and two o'clock, the thermometer rose to 100¼. On Tuesday, August 5, at half-past one o'clock, it stood 100½ degrees, being the warmest day this season.—[Phil. Herald.]

The *Mechanics' Magazine and Register of Inventions and Improvements* is published by the Proprietors, D. K. Minor and J. E. Challis, at No. 35 Wall street, New-York: in *weekly* sheets of 16 pages, at 6¼ cents—in monthly parts of 64 pages, at 31¼ cents—in volumes of 384 pages, in cloth boards, at $1.75—or at $3 per annum, *in advance*.—John Knight, (formerly proprietor of the London Mechanics' Magazine,) Editor.